

CLAIMS

At least the following is claimed:

- 1 1. A composition, comprising:
 2 a basic component;
 3 an acidic component;
 4 at least one monoacrylate component;
 5 a light sensitive initiator, wherein a polymerization reaction
 6 between the at least one monoacrylate component and the light sensitive
 7 initiator occurs upon exposure to optical energy; and
 8 a polar binder comprising a viscosity modifier and a surface
 9 tension modifier, wherein the polar binder is capable of stimulating a
 10 crosslinking reaction between the basic component and the acidic
 11 component.
- 1 2. The composition of claim 1, wherein the light sensitive initiator is selected
 2 from ultraviolet initiators, visible initiators, and combinations thereof.
- 1 3. The composition of claim 1, further comprising components selected
 2 from a retardant, an inhibitor, a wetting agent, a colorant, and
 3 combinations thereof.
- 1 4. The composition of claim 1, wherein a powder includes the basic
 2 component, the acidic component; and wherein the polar binder includes
 3 a polar solvent, a monoacrylate component, the surface tension modifier,
 4 the viscosity modifier, and the light sensitive initiator.
- 1 5. The composition of claim 1, wherein a powder includes the basic
 2 component; wherein the polar binder includes a polar solvent, the acidic
 3 component, a monoacrylate component, the surface tension modifier,
 4 the viscosity modifier, and the light sensitive initiator.

- 1 6. The composition of claim 1, wherein a powder includes the basic
2 component, a first acidic component; wherein the polar binder a polar
3 solvent, a second acidic component, a monoacrylate component, the
4 surface tension modifier, the viscosity modifier, and the light sensitive
5 initiator.
- 1 7. The composition of claim 1, wherein the powder components have a
2 particle size from about 1 to 100 microns.
- 1 8. The composition of claim 1, wherein the viscosity modifier is selected
2 from ethanol, hexanediol, pentanediol, ethylene glycol diacetate,
3 potassium aluminium sulphate, isopropanol, ethylene glycol monobutyl
4 ether, diethylene monobutyl ether, dodecyldimethylammonium
5 propoane sulphonate, glycerine triacetate, ethyl acetoacetate, polyvinyl
6 pyrrolidone, polyethylene glycol, polyacrylic acid, sodium polyacrylate,
7 and combinations thereof.
- 1 9. The composition of claim 1, wherein the surface tension modifier is
2 selected from ethanol, hexanediol, pentanediol, tergitols, ethylene
3 glycols, fluorosurfactants, and combinations thereof.
- 1 10. The composition of claim 1, wherein the basic component is selected
2 from metal oxides, metal oxide salts, reactive glasses, and combinations
3 thereof.

1 11. The composition of claim 1, wherein the acidic component is selected
 2 from alginic acid, gum arabic, nucleic acids, pectins, proteins,
 3 carboxymethylcellulose, ligninsulphonic acids, acid-modified starch,
 4 polyacrylic acid, polymethacrylic acid, polymethacrylic acid copolymer
 5 with methyl methacrylate, polyvinyl sulphonic acid, polystyrene sulphonic
 6 acid, polysulphuric acid, polyvinyl phosphonic acid, polyvinyl phosphoric
 7 acid, the homo- and copolymers of unsaturated aliphatic carbonic acids,
 8 the anhydrides of the unsaturated aliphatic carbonic acids, and
 9 combinations thereof.

1 12. A method of producing a structure, comprising the steps of:
 2 providing a powder, wherein the powder includes at least one
 3 component selected from a basic component and a first acidic
 4 component;
 5 providing a polar binder, wherein the polar binder includes a
 6 surface tension modifier and a viscosity modifier, and wherein the polar
 7 binder includes at least one component selected from a polar solvent, a
 8 second acidic component, a monoacrylate component, and a light
 9 sensitive initiator;
 10 dispensing the powder and the polar binder onto a build platform
 11 to form a layer of a composition; and
 12 forming a three-dimensional object from the composition on the
 13 build platform.

1 13. The method of claim 12, wherein dispensing includes:
 2 dispensing a layer of the powder; and
 3 dispensing a layer of the polar binder onto the layer of the powder
 4 thereby forming the layer of the composition.

1 14. The method of claim 12, wherein the polar binder is dispensed using at
 2 least one ink-jet printhead.

- 1 15. A solid freeform fabrication system for producing a three-dimensional
2 object, comprising:
3 a dispensing system including a powder and a polar binder,
4 wherein the dispensing system is adapted to dispense the powder and
5 the polar binder, wherein the powder includes at least one component
6 selected from a basic component and a first acidic component, and
7 wherein the polar binder includes at least one component selected from
8 a polar solvent, a second acidic component, a monoacrylate component,
9 a surface tension modifier, a viscosity modifier, and a light sensitive
10 initiator.
- 1 16. The solid freeform fabrication system of claim 15, wherein the dispensing
2 system includes at least one ink-jet printhead.
- 1 17. The solid freeform fabrication system of claim 15, wherein a first ink-jet
2 printhead includes the polar binder.
- 1 18. The solid freeform fabrication system of claim 15, wherein the dispensing
2 system includes a powder spreading system.
- 1 19. The solid freeform fabrication system of claim 15, further comprising:
2 a computer control system operative to control the dispensing
3 system.
- 1 20. The solid freeform fabrication system of claim 15, further comprising:
2 a computer aided design system.
- 1 21. The solid freeform fabrication system of claim 15, wherein the powder
2 components have a particle size from about 1 to 100 microns